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Elisabetta Carrea

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UNITED STATES PATENT AND TRADEMARK OFFICE

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BEFORE THE BOARD OF PATENT APPEALS  
AND INTERFERENCES

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*Ex parte* ELISABETTA CARREA

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Appeal 2009-002259  
Application 10/814,167  
Technology Center 3700

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Decided:<sup>1</sup> July 23, 2009

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Before WILLIAM F. PATE III, STEVEN D.A. McCARTHY  
and KEN B. BARRETT, *Administrative Patent Judges*.

McCARTHY, *Administrative Patent Judge*.

DECISION ON APPEAL

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<sup>1</sup> The two-month time period for filing an appeal or commencing a civil action, as recited in 37 C.F.R. § 1.304 (2008), begins to run from the Decided Date shown on this page of the decision. The time period does not run from the Mail Date (paper delivery) or the Notification Date (electronic delivery).

STATEMENT OF THE CASE

The Appellant appeals under 35 U.S.C. § 134 (2002) from the Examiner's decision finally rejecting claims 1, 2, 4-10, 22-25 and 28 under 35 U.S.C. § 103(a) (2002) as being unpatentable over Golomb (US 5,724,805, issued Mar. 10, 1998) and Wunning (US 5,154,599, issued Oct. 13, 1992); finally rejecting claims 3, 12-14, 16, 20, 21 and 25 under § 103(a) as being unpatentable over Golomb, Wunning and Yoshimoto (JP 10-89614 A1, publ. Apr. 10, 1998); finally rejecting claims 11 and 15 under § 103(a) as being unpatentable over Golomb, Wunning and Griffin (US 6,947,098 B2, issued Dec. 24, 2002); finally rejecting claims 17-19 under § 103(a) as being unpatentable over Golomb, Wunning, Griffin and Benson (US 5,636,977, issued Jun. 10, 1997); and finally rejecting claims 26 and 27. We have jurisdiction under 35 U.S.C. § 6(b) (2002).

We AFFIRM the Examiner's decision rejecting claims 1-25 and 28. Although the Examiner and the Appellant agree that claims 26 and 27 stand rejected (*See* Final Office Action, Dec. 8, 2006 at 1; Br. 3), the Examiner has not articulated any reason for rejecting these claims. We summarily REVERSE the Examiner's decision rejecting claims 26 and 27.

Claim 1 is the sole independent claim on appeal:

1 A combustion process comprising:  
forming a substantially nitrogen-free gas  
mixture from oxidant, fuel, and inert gas; and  
combusting said gas mixture in a burner,  
wherein combusting comprises flameless  
combustion.

ISSUES

The Appellant argues independent claim 1 and dependent claim 12 separately. Claims 2, 4-10, 22-24 and 28 stand or fall with claim 1 for purposes of the rejection of those claims under § 103(a) as being unpatentable over Golomb and Wunning. Claims 3, 12-14, 16, 20, 21 and 25 stand or fall with claim 12 for purposes of the rejection of those claims under § 103(a) as being unpatentable over Golomb, Wunning and Yoshimoto. (Br. 5). Since claim 25 depends from claim 12, we do not sustain the Examiner's rejection of claim 25 under § 103(a) as being unpatentable over Golomb and Wunning alone.

The Examiner finds that Golomb discloses forming a substantially nitrogen-free gas mixture from substantially pure oxygen, an oxidant; fuel; and carbon dioxide, an inert gas. (*See* Ans. 4). The Examiner concludes that the method of claim 1 would have been obvious since Wunning would have suggested combusting the gas mixture using flameless combustion so as to lower nitrogen oxide ["NO<sub>x</sub>"] values and reduce noise in the burner (Ans. 14). The Appellant contends that Golomb and Wunning would not have provided one of ordinary skill in the art reason to use flameless combustion to lower NO<sub>x</sub> since Golomb's fuel mixture is nitrogen-free even before combustion. (Br. 15).

The Examiner concludes that the installation of claim 12 would have been obvious since Yoshimoto would have suggested bringing the oxygen and fuel together in the burner to form a gas mixture having a temperature above the self-ignition temperature of the gas mixture so as to ignite without need for a pilot burner. (Ans. 17). The Appellant, based on the drawing figures of Yoshimoto, appears to contend that Yoshimoto does not disclose

1 heat transfer between the hot combustion gases and the combustion air  
2 sufficient to bring the fuel and air to a temperature above the self-ignition  
3 temperature. (Br. 16).

4 The Appellant relies solely on the contentions directed against the  
5 rejections of claims 1 and 12 in support of the patentability of claims 11 and  
6 15 over Golomb, Wunning and Griffin and of claims 17-19 over Golomb,  
7 Wunning, Griffin and Benson.

8 This appeal turns on two issues:

9 Has the Appellant shown that the Examiner failed to  
10 articulate reasoning with some rational underpinning sufficient  
11 to support the conclusion that Golomb and Wunning would  
12 have provided one of ordinary skill in the art reason to use  
13 flameless combustion to oxidize a nitrogen-free mixture of  
14 substantially pure oxygen, fuel and carbon dioxide?

15 Has the Appellant shown that the Examiner failed to  
16 articulate reasoning with some rational underpinning sufficient  
17 to support the conclusion that Golomb, Wunning and  
18 Yoshimoto would have provided one of ordinary skill in the art  
19 reason to include bringing oxygen and fuel together in a burner  
20 to form a gas mixture having a temperature above the self-  
21 ignition temperature of the gas mixture prior to oxidizing the  
22 oxygen and fuel by flameless combustion?

#### 23 24 FINDINGS OF FACT

25 The record supports the following findings of fact (“FF”) by a  
26 preponderance of the evidence.

1           1.     Golomb discloses a natural gas-fired power plant comprising an  
2     air separation/CO<sub>2</sub> capture [“AS/CC”] unit and a gas turbine including a  
3     combustor. (Golomb, col. 5, ll. 35-45).

4           2.     Golomb’s AS/CC separates air into liquid oxygen, gaseous  
5     nitrogen and argon. The liquid oxygen is evaporated in the process of  
6     condensing carbon dioxide produced in the combustor. (*Id.*)

7           3.     Golomb describes mixing the oxygen with exhaust gas, that is,  
8     carbon dioxide, and supplying the mixture to the combustor. (Golomb, col.  
9     7, ll. 53-56). The oxygen and carbon dioxide mix with natural gas fuel in  
10    the combustor prior to combustion. (Golomb, col. 9, l. 66 – col. 10, l. 3).

11          4.     Golomb also describes supplying the oxygen directly to the  
12    combustor. (Golomb, col. 7, ll. 56-58). The oxygen mixes with natural gas  
13    fuel in the combustor prior to mixing with diluting carbon dioxide.

14          5.     Golomb describes gradually introducing diluting carbon  
15    dioxide along the combustor to oxidize any carbon monoxide entrained in  
16    the carbon dioxide as fully as possible. (Golomb, col. 9, ll. 60-61 and col.  
17    10, ll. 8-14).

18          6.     Wunning describes combusting a mixture of exhaust gas,  
19    combustion air and fuel by means of substantially flameless, pulse-free  
20    oxidation. (Wunning, col. 2, ll. 36-50).

21          7.     Wunning discloses that, to set the flameless oxidation of the  
22    fuel in motion, an adequate quantity of exhaust gas for admixing with the  
23    combustion air must be available and the mixture of combustion air and  
24    exhaust gas must be at least at ignition temperature. (Wunning, col. 4, ll. 1-  
25    5; *see also id.*, col. 6, ll. 55-61).

8. Wunning discloses that one advantage of oxidizing the fuel by flameless combustion is the relatively low temperature of oxidation leads to low nitrogen oxide formation. (Wunning, col. 2, ll. 18-20 and col. 2, l. 62 – col. 3, l. 3).

9. Wunning discloses that another advantage of oxidizing the fuel by flameless combustion is a drastic reduction in the noise level in the combustion chamber due to the suppression of pressure fluctuations in the flame. (Wunning, col. 3, ll. 3-9).

10. Yoshimoto describes a radian tube burner including a pair of alternately-activated burners. (Yoshimoto 22, ¶ 0023). Yoshimoto's radian tube burner includes rows of heat accumulating bodies positioned near each of the burners. (Yoshimoto 15-16, ¶ 0016). The heat accumulating bodies accumulate heat from the exhaust gases generated in the radian tube burner. The heat accumulating bodies use the accumulated heat to preheat the combustion air and the fuel. (*Id.*; Yoshimoto 36, ¶ 0036).

11. Yoshimoto discloses that preheating the combustion air above the natural ignition temperature of the fuel obviates the need for a pilot burner. (Yoshimoto 36-37, ¶ 0036).

# PRINCIPLES OF LAW

The Appellant has not identified any objective evidence in the record which might have tended to prove secondary indicia of nonobviousness. (*See* Br. 24). Therefore, the Appellant's burden on appeal is to show that the Examiner has produced insufficient evidence of prima facie obviousness. *In re Kahn*, 441 F.3d 977, 985-86 (Fed. Cir. 2006)(emphasis omitted).

ANALYSIS

The Appellant has not met this burden with respect to the rejection of representative claim 1. The Appellant does not dispute that Golomb describes forming a substantially nitrogen-free gas mixture from oxidant, namely, substantially pure oxygen; a fuel, namely, natural gas; and inert gas, namely, carbon dioxide. (*See* Br. 9; *see also* FF 2-5). Neither does the Appellant dispute that Wunning describes benefits of flamelessly combusting a gas mixture including combustion air, fuel and carbon dioxide in a burner. (*See* Br. 10; *see also* FF 6, 8 and 9). The Examiner concludes that the teachings of Golomb and Wunning would have provided one of ordinary skill in the art reason to form the substantially nitrogen-free gas mixture of substantially pure oxygen, natural gas and carbon dioxide described by Golomb and then combust the gas mixture flamelessly in a burner.

The Examiner articulates two such reasons for the combination: First, the Examiner concludes that one of ordinary skill in the art would have recognized from the teachings of Wunning that the use of flameless combustion would have lowered the nitrogen oxide level produced by the combustion. Second, the Examiner concludes that that one of ordinary skill in the art would have recognized from the teachings of Wunning that the use of flameless combustion would have lowered the noise level produced by the combustion. (Ans. 14). The Appellant attacks the first reason as lacking rational underpinning in the teachings of Golomb and Wunning (Br. 15) but fails to provide any explanation as to why the second reason might lack such rational underpinning. Since the Examiner has articulated reasoning with some rational underpinning (*see, e.g.*, FF 9) in support of the legal



1 conclusion of obviousness, the Examiner's rejections of representative claim  
2 1 and of the claims grouped with claim 1 stand. *See Kahn*, 441 F.3d at 988.

3 Neither has the Appellant met the burden with respect to the rejection  
4 of representative claim 12. Golomb discloses bringing oxygen and fuel  
5 together in the burner first to form a gas mixture. (FF 4 and 5). The  
6 Appellant does not dispute that Wunning discloses preheating the oxidant,  
7 namely, the combustion air, above the self-ignition temperature of the gas  
8 mixture. (*See Br. 10*). In fact, Wunning suggests that preheating the  
9 combustion air so as to raise the temperature of the mixture above the self-  
10 ignition temperature promotes setting flameless combustion in motion. (*See*  
11 *FF 7*). These teachings and suggestions themselves would have provided  
12 one of ordinary skill in the art reason to provide an installation useful for  
13 carrying out the method of representative claim 1 including a mixture  
14 forming device configured and arranged to bring oxygen and fuel together in  
15 a burner to form a gas mixture having a temperature above the self-ignition  
16 temperature of the gas mixture.

17 The Examiner finds that Yoshimoto discloses preheating combustion  
18 air or fuel above the self-ignition temperature of a combustion gas mixture  
19 in order to promote the ignition of the combustion gas mixture without a  
20 pilot burner. (*See Ans. 16-17; see also FF 10 and 11*). Yoshimoto describes  
21 preheating the combustion air or gas using heat from the exhaust gas through  
22 the medium of heat accumulating bodies (FF 10), even assuming for  
23 purposes of this appeal only the absence of substantial heat transfer through  
24 direct contact between the combustion gas mixture and the exhaust gas. As  
25 the Examiner concludes (*see Ans. 6*), this disclosure, together with  
26 Wunning's suggestion that preheating the combustion air so as to raise the

1 temperature of the mixture above the self-ignition temperature promotes  
2 setting flameless combustion in motion, would have provided one of  
3 ordinary skill in the art reason to provide an installation useful for carrying  
4 out the method of representative claim 1 including a mixture forming device  
5 configured and arranged to bring oxygen and fuel together in a burner to  
6 form a gas mixture having a temperature above the self-ignition temperature  
7 of the gas mixture. Since the Examiner has articulated reasoning with some  
8 rational underpinning in support of the legal conclusion of obviousness, the  
9 Examiner's rejection of representative claim 12 and of the claims grouped  
10 with claim 12 stand.

## 11 12 CONCLUSIONS

13 The Appellant has not shown that the Examiner failed to articulate  
14 reasoning with some rational underpinning sufficient to support the  
15 conclusion that Golomb and Wunning would have provided one of ordinary  
16 skill in the art reason to use flameless combustion to oxidize a nitrogen-free  
17 mixture of substantially pure oxygen, fuel and carbon dioxide. Therefore,  
18 the Appellant has not shown that the Examiner erred in rejecting claims 1, 2,  
19 4-10, 22-24 and 28 under § 103(a) as being unpatentable over Golomb and  
20 Wunning.

21 The Appellant has not shown that the Examiner failed to articulate  
22 reasoning with some rational underpinning sufficient to support the  
23 conclusion that Golomb, Wunning and Fujii would have provided one of  
24 ordinary skill in the art reason to include bringing oxygen and fuel together  
25 in a burner to form a gas mixture having a temperature above the self-  
26 ignition temperature of the gas mixture prior to oxidizing the oxygen and

1 fuel by flameless combustion. Therefore, the Appellant has not shown that  
2 the Examiner erred in rejecting claims 3, 12-14, 16, 20, 21 and 25 under  
3 § 103(a) as being unpatentable over Golomb, Wunning and Yoshimoto.

4 The Appellant relies solely on the contentions directed against the  
5 rejections of claims 1 and 12 in support of the patentability of claims 11 and  
6 15 over Golomb, Wunning and Griffin and of claims 17-19 over Golomb,  
7 Wunning, Griffin and Benson. Therefore, the Appellant has not shown that  
8 the Examiner erred in rejecting claims 11 and 15 under § 103(a) as being  
9 unpatentable over Golomb, Wunning and Griffin or in rejecting claims 17-  
10 19 under § 103(a) as being unpatentable over Golomb, Wunning, Griffin and  
11 Benson.

12  
13 **DECISION**

14 We AFFIRM the Examiner's decision rejecting claims 1-25 and 28.

15 We REVERSE the Examiner's decision rejecting claims 26 and 27.

16 No time period for taking any subsequent action in connection with  
17 this appeal may be extended under 37 C.F.R. § 1.136(a). *See* 37 C.F.R.  
18 § 1.136(a)(1)(iv) (2007).

19  
20 **AFFIRMED-IN-PART**

Appeal 2009-002259  
Application 10/814,167

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